EXOMARS Mission and Spacecraft Architecture

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MISSION DESCRIPTION

The ExoMars Mission is the first **ESA** led robotic mission of the Aurora Programme approved by the ESA Council at ministerial level on 6 December 2005 and combines technology development with investigations of major scientific interest. Italy is by far the major contributor to the mission through the strong support of the Italian Space Agency **ASI**.
ExoMars will search for traces of past and present life, characterise the Mars geochemistry and water distribution, improve the knowledge of the Martian environment and geophysics, and identify possible surface hazards for future human exploration missions.
ExoMars will also validate the technology for safe Entry, Descent and Landing (EDL) of a large size spacecraft on Mars, the surface mobility and the access to subsurface.
The ExoMars project is presently undergoing its B1 phase with **Alcatel Alenia Space-Italy** as Industrial Prime Contractor.

Launch and Transfer To Mars

The current mission baseline foresees the launch of a Carrier spacecraft and a Descent Module (DM) by means of a Soyuz 2b launcher lifting from Kourou.
An alternative launch date has been defined, with departure between mid-May and mid-June 2013, for which the mission and system design shall be compatible. The arrival in this case is in March 2015 and a DSM is also required.

Entry Descent and Landing

The Descent Module will separate from the Carrier with a relative velocity of 1 m/s and start the so called Entry, Descent and Landing phase.
No Mars Avoidance Manoeuvre for the Carrier is foreseen, due to the need to save propellant; this is pending confirmation that the Planetary Protection measures taken on the Carrier are sufficient to avoid Mars surface biological contamination.

Mars Operations

After landing on the Mars surface the ExoMars Descent Module will deploy two science elements on the Martian surface: a high-mobility Rover and a fixed station — the Geophysics/Environment Package (GEP).
The ExoMars Rover will carry a comprehensive suite of analytical instruments dedicated to exobiology and geological research: the Pasteur Payload. Over its planned 6-months lifetime, the Rover will ensure a regional mobility (several kilometres) searching for traces of past and present life. It will do this by collecting and analysing samples from surface and from underground, down to a depth of 2 meters by means of a Driller and a Sample Preparation and Distribution System.

The challenges of the mission

The Exomars mission presents a number of unique technological and programmatic challenges to the European space community; the following mission objectives represent new achievements for Europe:

- landing of a large spacecraft on Mars
- development of a Mars rover
- drilling of soil samples from under the Martian surface (this has never been achieved so far), and analysis of the samples for identification of possible traces of life
- achievement of a very high degree of sterilisation of the complete landing spacecraft, this again was never achieved by any mission in the past. The complete sterilisation is necessary in order to avoid the contamination of the Martian samples by terrestrial micro-organisms.